CLAIMS

1. A triangularly shaped magnetron disposable at a backside of a substantially circular sputtering target, comprising:

a triangularly shaped inner pole of a first magnetic polarity;

a generally triangularly shaped outer pole of a second magnetic polarity opposite said first magnetic polarity surrounding said inner pole, separated therefrom by a gap, and having first and second sides generally extending along radial directions of said target and joined at an apex corner and a third side connecting said first and second side away from said apex corner, said apex corner being disposed near a center of said target within 20% of a radius of said target.

2. The magnetron of Claim 1, wherein third side has an arcuate shape concave with respect to said apex corner.

3. The magnetron of Claim 2, wherein said third side is located near an outer periphery of said target within 25% of said radius of said target.

4. The magnetron of Claim 1, wherein said inner and outer pole pieces are rotatable about said center of said target parallel to a face of said target.

5. The magnetron of Claim 1, wherein an integrated magnetic flux produced by said outer pole is at least 1.5 times an integrated magnetic flux produced by said inner pole.

6. A method of sputtering a material from a target comprising a metal onto a working substrate supported on a pedestal in a system including a magnetron disposed on a

side of said target opposite said pedestal and including an outer pole of one magnetic polarity and surrounding an inner pole of another magnetic polarity, wherein said outer pole extends from said center of said target to a peripheral portion of said target and has an area smaller than a similarly extending circle, said method comprising:

rotating said magnetron about a center of said target to achieve full sputtering coverage of said target; and

capacitively coupling power into said chamber at least partially by applying DC power to said target but not including inductively coupling power into said chamber to thereby excite said working gas into a plasma to sputter said metal from said target onto said working substrate, an amount of said DC power being no more than 18kW normalized to a circular reference substrate of 200mm diameter, thereby achieving an ionization density of said metal of at least 20%.

7. The method of Claim 6, wherein said metal comprises aluminum.

8. The method of Claim 6, wherein said metal comprises copper.

9. The method of Claim 6, wherein said metal comprises titanium.

10. The method of Claim 6, wherein an integrated magnetic flux produced by said outer pole is at least 1.5 times an integrated magnetic flux produced by said inner pole.

11. An tungsten fill process, comprising the steps of:

placing a substrate containing a hole formed in a dielectric layer in a magnetron sputter reactor including a titanium target and a rotatable magnetron comprising an inner pole of a first magnetic polarity and producing a first total magnetic flux and an outer pole of an opposite second magnetic polarity,

producing a second total magnetic flux at least 1.5 times said first magnetic flux, and surrounding said first magnetic pole;

in said magnetron sputter reactor, sputtering a barrier layer of titanium and titanium nitride into said hole; and

thereafter filling tungsten into said hole of said substrate by chemical vapor deposition.

12. The process of Claim 11, further comprising a rapid thermal anneal of said substrate performed between said sputtering and filling steps.

13. The process of Claim 11, wherein there is no annealing step between said sputtering and filling steps.